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Linpack performance Haswell E (Core i7 5960X and 5930K)

Written on August 29, 2014 by Dr Donald Kinghorn

The new Intel "Haswell E" desktop processors are out, and yes, they are really good! Along with the new processors we have new motherboards, chipsets, and DDR4 memory lots of good stuff. Matt has some very good articles up on all this new stuff. You should have a look...

I'm mostly interested in numerical performance and potential for use with scientific computing. I'll be doing new hardware testing over the next couple of weeks so expect to see some interesting posts (assuming you get excited by numbers the way I do :-).

Intel has also just released a new version of their excellent compilers and tools, Parallel Studio XE 2015, so I'll be giving the new compilers a workout too.

The first thing I usually run on new Intel hardware is the Linpack parallel benchmark optimized with the MKL numerical libraries. This will usually get you close to theoretical peak double precision numerical performance. I've got some numbers for the new Core i7 5960X and 5930K processors. I'll show these in a chart with some other processors for comparison.

The Core i7 5960X outperforms the fastest and highest core-count Sandy Bridge dual Xeon system! Not bad for a "desktop" processor!

Note: Theoretical peak is complicated on the new generations of processors but it is basically

```
CPU GHz * number of cores * vector ops (AVX) * special instructions (FMA3)
```

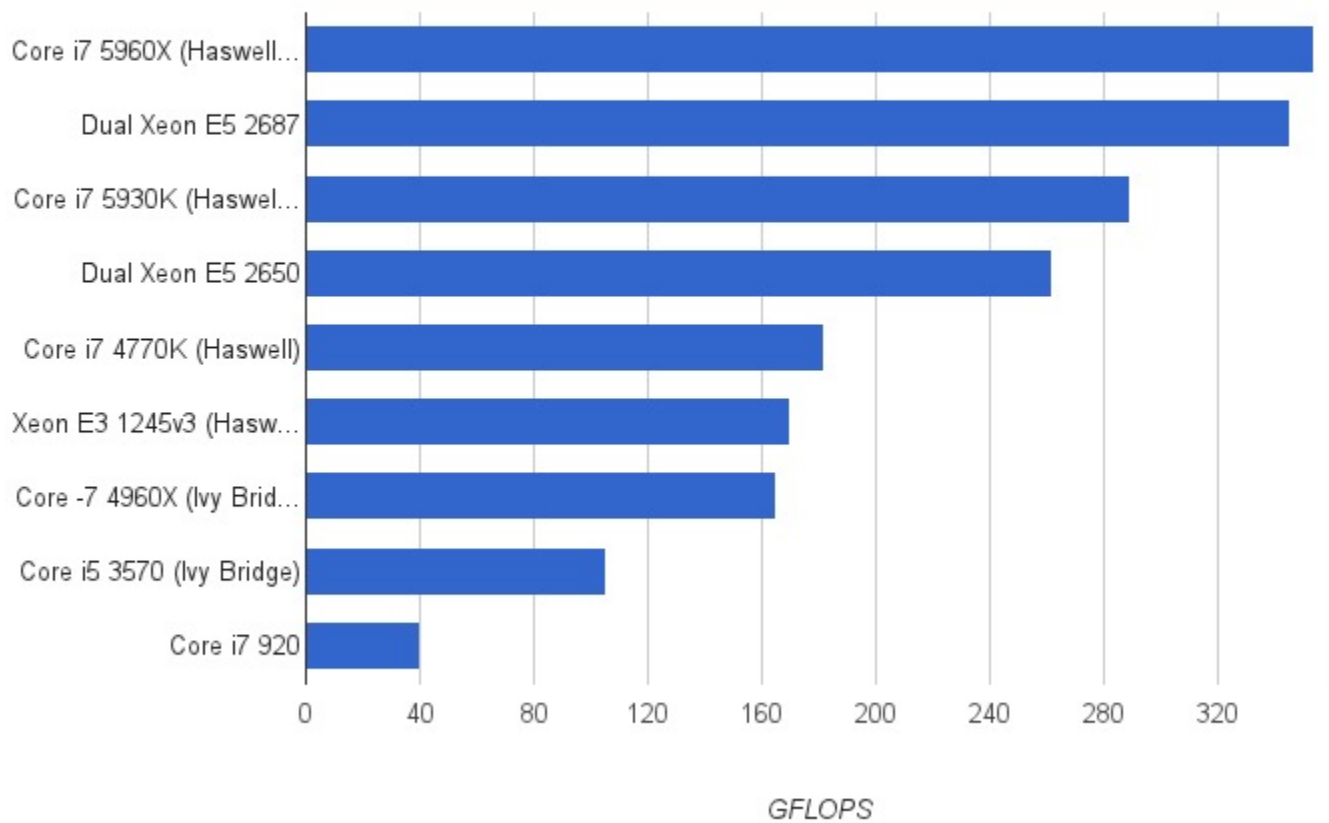
So for, the Core i7 5960X we expect a theoretical peak of,

```
3.0GHz * 8-cores * 8 DP-vector ops * 2 from FMA3 = 384 GFLOPS
```

(384 billion double precision floating point operations per second) From the linpack run we did we see over 90% of that ... VERY GOOD!

The following chart has Linpack numbers from various systems and various versions of the Intel compilers that I've used, so the numbers should be taken as relative rather than absolute. (I would take them with a +- 5% grain of salt –if that expression means anything to you!)

Linpack Benchmark from Intel MKL



Linpack benchmark using the Intel MKL optimizations

Processor	Brief Spec	Linpack (GFLOPS)
Core i7 5960X (Haswell E)	8 core @ 3.0GHz AVX2	354
Dual Xeon E5 2687W	16 cores @ 3.2GHz AVX	345
Core i7 5930K (Haswell E)	6 cores @ 3.5GHz AVX2	289
Dual Xeon E5 2650	16 cores @ 2.0GHz AVX	262
Core i7 4770K (Haswell)	4 cores @ 3.5GHz AVX2	182
Xeon E3 1245v3 (Haswell)	4 cores @ 3.4GHz AVX2	170
Core -7 4960X (Ivy Bridge)	6 cores @ 3.6GHz AVX	165
Core i5 3570 (Ivy Bridge)	4 cores @ 3.4GHz AVX	105

Processor	Brief Spec	Linpack (GFLOPS)
Core i7 920	4 cores @ 2.66GHz SSE4.2	40

Happy computing! --dbk

Tags: Haswell E, Linpack, HPC, benchmark